

# Efficient EUV sources by short CO<sub>2</sub> laser-produced plasmas



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## Abstract

We develop the hybrid laser system with the sub-nanosecond laser and TEA CO<sub>2</sub> laser amplifier to produce the short pulse and high energy pulses at a wavelength of 10.6  $\mu\text{m}$ . We will report the preliminary experimental results of the extreme ultraviolet sources from the short CO<sub>2</sub> laser-produced plasmas (LPPs).

## Summary

We have demonstrated short pulse CO<sub>2</sub> laser with amplifier system at the repetition rate of 10 Hz in Utsunomiya University.

- (1) Pulse duration was variable from 3 to 15 ns with high energy pulse.
- (2) High beam quality was achieved ( $M^2$  does not measure yet.)

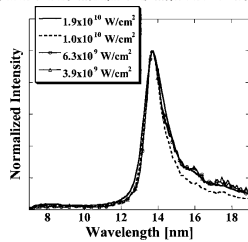
## Background: CO<sub>2</sub> laser-produced UTA plasmas

Comparative study on emission characteristics of extreme ultraviolet radiation from CO<sub>2</sub> and Nd:YAG laser-produced tin plasmas

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Enhancement of extreme ultraviolet emission from a CO<sub>2</sub> laser-produced Sn plasma using a cavity target

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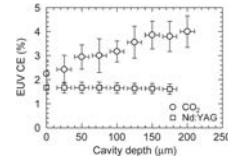
ELI-NV Extreme Ultraviolet Nanophysics System Development Association, 1200 Murata, Hiratsuka, Kanagawa 254-8587, Japan

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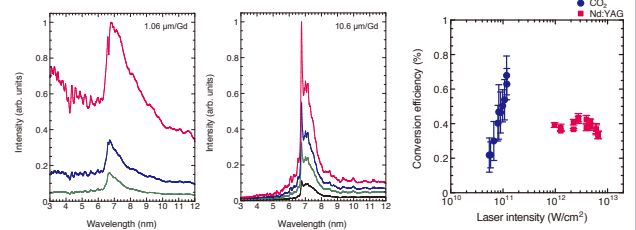
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We demonstrated enhancement of in-band conversion efficiency (CE) at 13.5 nm of the extreme ultraviolet (EUV) emission from a tin (Sn) cavity target irradiated by a CO<sub>2</sub> laser pulse. Whereas a planar Sn target produced an in-band CE of around 2%, the use of cavity targets significantly enhanced the EUV emission energy and the EUV CE. An EUV CE of 4% was observed for a Sn cavity target with a depth of 200  $\mu\text{m}$  which is one of the highest values ever reported. © 2007 American Institute of Physics. [DOI: 10.1063/1.2820451]

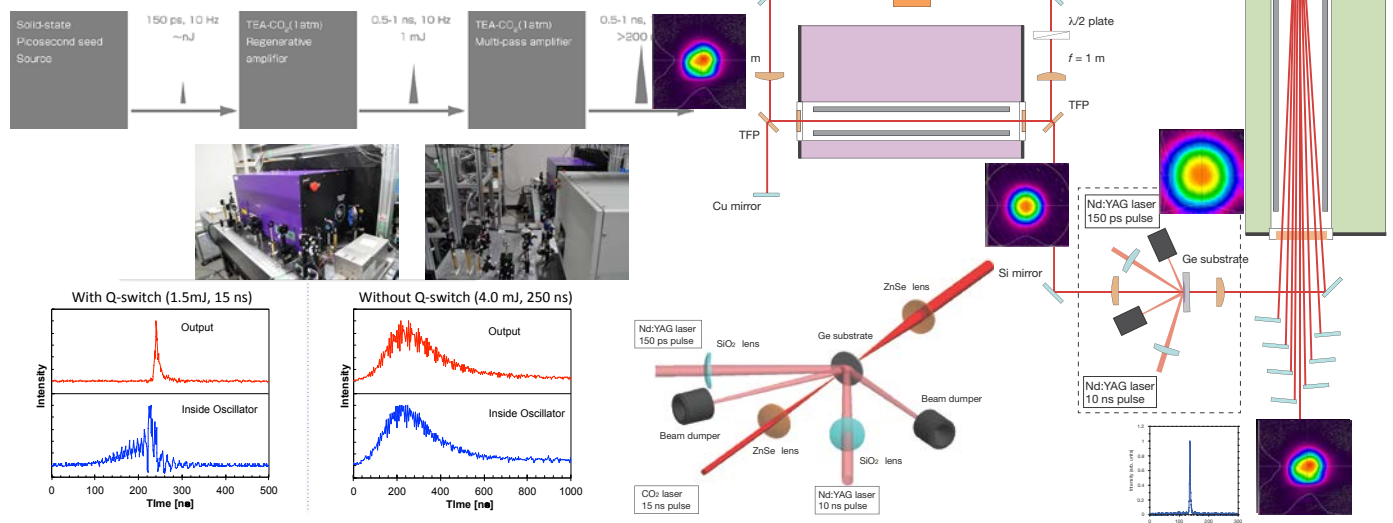


CO<sub>2</sub> laser-produced <sub>64</sub>Gd plasmas for 6.7 nm (beyond EUV)

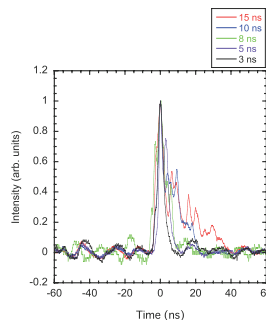


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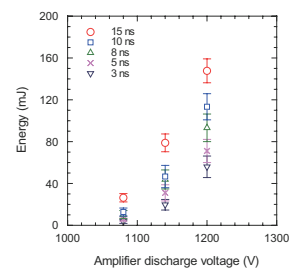
## Setup & Results



Short pulse CO<sub>2</sub> laser by use of a pulse shaper



10-Hz CO<sub>2</sub> amplification



Characteristics of extreme ultraviolet emission from mid-infrared laser-produced rare-earth Gd plasmas

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